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Concentrated growth factors (CGF): morphological and biochemical characterization

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Concentrated growth factors (CGF) represents the novel generation of solid platelet concentrate preparations (1-2). These 100% autologous preparations, obtained from a venous blood sample, not only enhance tissue healing but also improve the clinical outcomes of various surgical procedures, reducing complications like pain, inflammation and morbidity (3). Considering the few data on CGF morphology and its biological properties, the aim of this study was to analyse the CGF structure (blood cell localization and fibrin matrix architecture) and the *in vitro* cumulative release of seven growth factors (PDGF-AB, VEGF, TNF-α, TGF-β1, IGF-I, BDNF and BMP-2). CGF was obtained from volunteer donors using a specific protocol of centrifugation. Blood cell localization and fibrin architecture were evaluated after properly staining and immunostaining protocols. The kinetics of the growth factor release were performed by incubation of the CGF in a free growth factors cell medium, at 37°C for 5 hours, 1, 3, 6, 7 and 8 days. After each incubation period, the medium was collected, centrifuged and stored at −80 °C until analysis. The total quantity of growth factors was checked using ELISA kits. After venous blood centrifugation, the CGF obtained consisted in three parts: the upper white part (PPP), the lower red part (RBC) and the middle "buffy coat" part (interface between white and red part). The results showed that platelets and leukocytes were localized in the buffy coat, whereas the erythrocytes were present only in the red part of CGF. Moreover, in the white part, the fibrin network and architecture changed moving far from the buffy coat becoming less compact. The *in vitro* cumulative release of growth factors revealed that each of them had a specific kinetic. Considering the mean value obtained for each time point from all volunteers, PDGF-AB, TGF-β1 and IGF-1 had a constant kinetic release, reaching the maximum accumulation at day 3rd and 6th respectively; VEGF and BMP-2 had a slow kinetic release, reaching the maximum accumulation at day 8th; TNF-α and BDNF had a fast kinetic release, reaching the maximum accumulation at day 1st and 3rd respectively. These findings support the clinical use of CGF and will allow us to better understand and improve the clinical outcomes.

References

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Keywords
CGF; growth factors release; fibrin matrix; platelets; platelet concentrates.